

CIRCLING THE EDUCATION DATA GLOBE

DANIELE VIDONI
KORNELIA KOZOVSKA

Daniele Vidoni is a senior economist of education for the Italian National Institute for Educational Evaluation (INVALSI).[†]
Kornelia Kozovska is a researcher at the European Commission JRC-Centre for Research on Lifelong Learning (CRELL).[‡]

On the international scene, reaching a general agreement on *what* data should be collected in education and *how* is an issue far from being settled. The United States is likely one of the countries with the most experience in dealing with issues of collection, storage, and treatment of social scientific data. In the field of education, the “Equality of Educational Opportunity Study (EEOS),” known by most as the Coleman Report of 1966, is a milestone that many investigators have used as a model for subsequent research. The development of ideas and models for the collection, management, and governance of education data is facilitated by the organizational structure of U.S. education—over 14,000 school districts in 50 independent state school systems. The fragmentation of the system and the enormous variation in district characteristics and responsibilities allow for different districts to simultaneously implement different strategies to solve similar problems, thereby optimizing the search for viable solutions. This U.S. advantage also has a cost: namely, that it’s difficult to track students across districts and states. Yet this cost is common to most actors in the international scene, and only recently have countries started addressing this issue seriously.

Indeed, in the past decades, more and more countries have begun collecting and analyzing data to inform educational policies. Some uses of data are genuinely new, while others refine and adapt ideas initially conceived in the U.S. This chapter explores some of the best practices with the aim of providing food for thought on the challenges of conceiving, explaining the need for, and implementing a “Holy Grail” of education data—i.e. a “robust longitudinal data system” as described by the Data Quality Campaign. These best practices from around the world may also inspire improvements in how existing data are collected, stored, analyzed, and communicated to families and to the public. Although a country’s search for the Holy Grail may be easier if it can learn from the experiences of others, some steps along the path are driven by a specific mix of culture, politics, and contextual variables. The journey can be broken up into at least three stages:

1. Collecting and using data for a school’s self-evaluation,
2. Collecting and using data for comparing institutions and informing parents, and
3. Collecting and using individual-level data for the effective management of schools and the education system.

This chapter includes snapshots of the current situations in Italy, England, and Korea, with each snapshot illustrating one of these steps. Italy, a large country with little tradition of data collection and accountability in education, is at the first stage; it has devoted massive efforts to setting up a national accountability system which can be seen by the schools as a tool rather than as a burden. The system collects student scores on standardized tests and extensive data on individual school characteristics. Though the information is standardized at the national level, so far the data have been used solely for self-evaluation purposes by schools. The hope is that the progressive development of a culture of evaluation (among the general public and within the school) will open the way to refinement of the system features and a much wider use of data both for counseling and evaluation purposes. Already the new national contract for Italian school principals ties a share of a principal’s salary to the results of a qualitative and quantitative evaluation process that makes use of the data collected through the national accountability system.

The United Kingdom is at the second stage. In the U.K., Achievement and Attainment Tables (also called league tables), which rank schools on the basis of student performance on centralized examinations, have been met with a good deal of criticism. However, the online availability of concrete information about school performance has been an important tool for informing parents' decisions about schools for their children; for self-evaluation and target-setting for schools; for assisting in the selection of schools by the government for particular initiatives; as well as for providing information on the effectiveness of particular types of school or policy initiatives.¹

The third stage is exemplified by the South Korean experience of shifting towards data-driven management of the national educational system as part of a larger 20-year move towards e-government. The National Education Information System (NEIS) in Korea—a centralized database holding complete information on schools, schools' administration, admissions, student records, and student individual characteristics, including the students' medical history—was developed in order to reduce the costs of data gathering and management, allowing a more efficient use of the existing information for governance. Yet, the sensitivity of the information collected is such that harsh critiques were immediately offered about the legality of creating such a comprehensive data set and about the risks of misuse and illegal access to so much data. These concerns resemble the present worries surrounding FERPA regulations in the U.S. The section on South Korea in this chapter describes in detail the characteristics of the database and the steps taken to defuse attacks on it. Before the case studies, an introductory section gives an overview of the structural characteristics and the models of governance of the educational systems in Italy, England, and Korea. The last section in the chapter sums up the lessons these international experiences hold for the U.S. debate on educational data.

The Educational Systems under Analysis: An Overview

The education systems of Italy, England, and Korea have similar structures. Education is compulsory at least to age 15, and students may enter a university after 12-13 years of basic education organized in 5–6 years at the primary level and then two levels of secondary education (lower secondary and upper secondary).² The models of educational governance, on the other hand, vary greatly—from the decentralized structure of the U.K. system through the gradual conferring of responsibility to provincial and municipal authorities in

Table 1

Education governance structures in Italy, England, Korea, and the United States

NATIONAL LEVEL	SECOND LEVEL	THIRD LEVEL	INSTITUTIONAL LEVEL	NOTES
Italy				
Advisory function —Ministry of Public Education (MPI) and Ministry of University and Scientific and Technological Research, National Education Council	20 regions	Provincial and municipality offices	School councils	Centralized policy making; increased delegation of administrative powers from central government via regions, provinces and communes to schools.
England				
Partial responsibility — Secretary of State; Overall responsibility — Department for Children, Schools and Families (DCSF) and Department for Innovation, Universities and Skills (DIUS)	Local Authorities (LAs)		School governing bodies	Devolved responsibility to schools/ school governing bodies; recent legislation allows for the creation of integrated children services departments, at local level, responsible for education, children and young people's health and social services.
Korea				
General management — Ministry of Education and Human Resources Development	Seven Municipal and nine Provincial Education Authorities (MPEAs) or Metropolitan Offices of Education (MPOEs)	Around 180 local offices of education (LOEs) (school district offices of education)	'School management committees'	Gradually increasing budgetary, administrative and curricular powers delegated to MPEAs and MPOEs.
US				
Funding and coordination of specific program areas — Federal government	50 states (mostly through State Boards of Education)	Local district school boards	School	Individual states provide policy guidelines; local districts operate schools within these guidelines. Some national (federal) initiatives influence state policy guidelines.

Korea to the still-rather-centralized-in-practice structure of the Italian education system. (See Table 1.)

Italy: Moving Slowly but Making Solid Progress

Italy has a long tradition regarding student evaluation. Indeed, national exams for all students at the end of each study cycle were first introduced in 1928 and are even referred to in the Constitution of the Republic of Italy.³ However, the implementation of a data-driven evaluation of the school system is only a recent process.

Historically, the centralization of the Italian school system has meant that the Ministry of Education defined, at the national level, the rules for most aspects of school life and the internal organization of the school. The role of school principal was to make sure that the school correctly applied the laws and administrative procedures. In this highly bureaucratic approach, the evaluation of the school consisted of school inspections aimed at ensuring that services were delivered in accordance with the law, with little focus on issues of school quality. Although school budgets are still defined and provided by the national government, in the past 15 years Italian schools have acquired increased operational autonomy and have started to use tools for self-evaluation and school improvement.⁴ The growing demand for instruments that the public and the school staff can use to understand school performance and improvements are behind the development of a model aimed at a system-wide evaluation of schools.

Development of the Evaluation System

The education data available in Italy have historically been quite limited. The main sources of data are the Ministry of Education and the National Statistical Service, which collect, report, and analyze administrative information on the student population (ethnicity, language, number of students, special needs students); school characteristics (school buildings, school assets); number and years of experience of school staff; and graduation and dropout rates. This information is updated almost every year at the regional level, but it is difficult to obtain detailed and comprehensive information at lower levels (school, district, and province). Information on student socioeconomic status, details about the staff, and student grades are only available at the individual school, though final grades for students

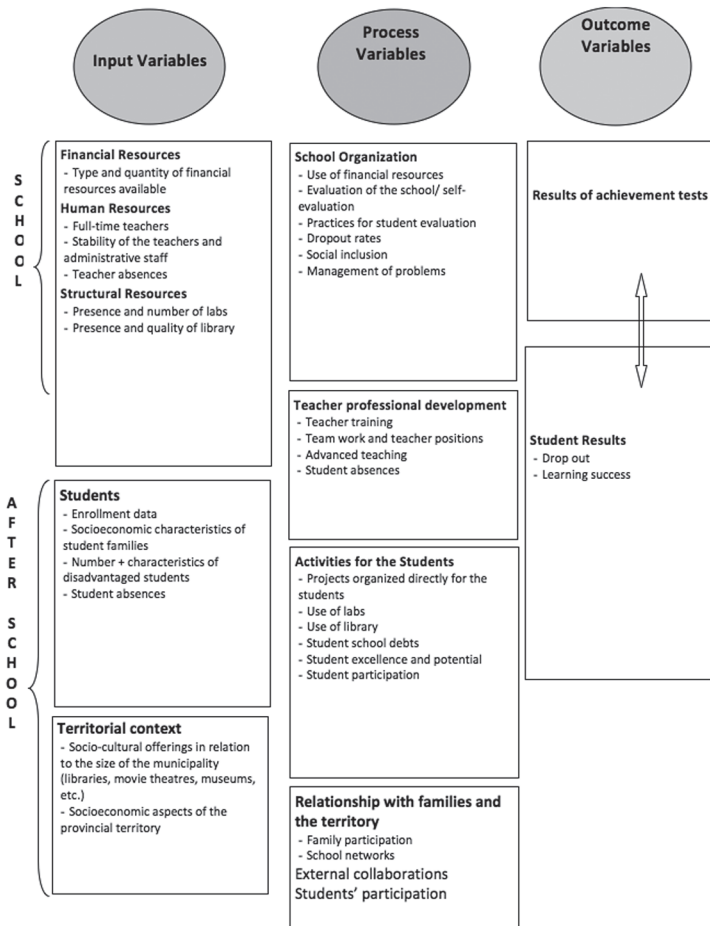
are also shared with the regional authority and the ministry. Clearly, this information is grossly insufficient to develop any data-driven policy. The need for more information led to the development of an evaluation process aimed at gathering information on all schools and students in the compulsory education range. This new evaluation process will supplement, not supplant, the process of administrative data collection described above. The development of the system has involved two distinct phases: three pilot projects (2001-04), which explored the possibility of putting into place a national system of evaluation (SNVI⁵), and then its actual implementation. While participation in the pilot projects was voluntary for schools, the national system of evaluation is now compulsory.

The first concrete step towards the creation of an evaluation system dealing with all aspects of schooling was the establishment of the National Institute for the Evaluation of Education and Training Systems (INVALSI⁶) in 1999. INVALSI, a public organization, was assigned the tasks of evaluating the efficiency and effectiveness of the entire national system of education, as well as of single schools; of researching the causes of success and failure; and of monitoring the effects of education policies put into place by the government.

As noted, the establishment of the evaluation system was preceded by an experimental phase comprised of three pilot projects between 2001 and 2004. These had the goal of testing the ability of the organization to produce, administer, and analyze the assessments and questionnaires that would make up the national evaluation system, and also to gauge the interest of schools. Participating schools were selected from among a pool of schools that had volunteered and that already had some experience with self-evaluation. The evaluation process involved multiple-choice tests in the designated subjects administered to students at three grade levels. The tests were linked to a school questionnaire probing the characteristics of the school system. Figure 1 presents the areas of analysis, which are investigated every year.

Pilot project one (2001-02) was carried out on a group of around 3,000 self-selected schools (about 25 percent of all schools) with previous experience in evaluation. The objectives set by the ministry for this study were to test Italian language and mathematics among students through multiple-choice tests. Pilot project two (2002-03) expanded the number of subjects evaluated to three: Italian, math, and science. Two groups of schools participated in the

Figure 1: Areas of analysis for school system evaluation



paper-based test—schools voluntarily taking part (6,755—around 50 percent of all schools), and schools from a statistical sample identified by INVALSI (589 schools). The third pilot project (2003-04) has maintained, in essence, the same setup of pilot project two, while the number of participating schools increased to 9,060.

The combination of evaluating student performance and the performance of the school is seen as a way to view education as a process of learning but also as a service provided by the state. In the pilot phase, INVALSI analyzed the data from the questionnaires and communicated the results to each school

individually, but there were no consequences for the schools. Rather, the information served as a tool for self reflection.

In 2004, the Ministry of Education started setting annual general objectives. These objectives—mainly identifiable with the reaching of the European Union Benchmarks for Education and Training⁷—are the basis for the national evaluation of the school system. The overarching goal is to have information which is public and comparable on the functioning and results of the education system. This means being able to measure the level of achievement at each school in comparison to the national objectives every year, thus enabling early identification, school by school, of the critical points in need of intervention.

The first nationwide survey was completed in 2004–05, and it included an evaluation of the overall quality of the school (quality of the yearly school plan, compulsory and voluntary extracurricular activities, and the existence of tutors for supporting teachers in primary schools) and a standardized evaluation of student results in mathematics, science, and Italian. The school questionnaires and the tests in the different subjects are distributed to the school in paper form. The materials are then collected and stocked at INVALSI, which proceeds to the scanning and the compilation of the databases.

The 2005–06 survey included some new elements: the employment of external evaluators and the identification of a statistically significant sample of upper secondary schools. (Since 2004–05, the assessment is compulsory for public and private primary and lower secondary schools but optional for upper secondary schools, so INVALSI makes sure to involve a statistically significant sample of upper secondary schools.)

The Use of Data

After receiving the student tests and the questionnaires, INVALSI produces descriptive statistics for the individual schools and for regions and macro-regions.⁸ The statistics for the regional and macro-regional levels are published on the INVALSI website, while only the individual schools have access to their own data and descriptive statistics. Thus as of now, each individual school is responsible for its own improvement.

This arrangement facilitates the collection of standardized data for all schools across the nation, but it impedes the direct comparison of individual school performance and characteristics. In fact, the aim of the Italian model has

been to stimulate continuous improvement at the school level by giving quick and confidential assessment results to each school along with comparable data about attainment at the national, regional, and provincial levels. Afterwards, data are analyzed by the school in relation to its particular context (social background, educational offerings, etc.)

This limited use of the data has been necessary because these first steps towards standardized evaluation and data collection were viewed with great suspicion by school staff and by labor unions in Italy. Slowly, stakeholders have become more aware of the need for objective information on school characteristics as a tool for improving school quality. Along the way, expectations have increased to the point that school principals and labor unions have agreed to link a share of the principals' salary to the results of an evaluation process. INVALSI is currently drafting a proposal for a model for principal evaluation, and is considering the necessary steps forward in terms of gathering the data necessary for the evaluation. These steps include the need to collect contextual information on the students, the development of a "unique pupil number" that could allow linking student and school characteristics for conducting analyses at the central level, and the importance of improving the quality of data at the level of the individual school. In principle, all parties have agreed to such plans and are considering the development of a national school register (i.e., a panel data set with the data for all students in Italy—which would be a giant step forward towards the data "Holy Grail" discussed in the introduction). There is even talk today, contrary to the mainstream opinion that prevailed two to three years ago, of tying high stakes to the tests for students and of using student performance to evaluate teacher performance.⁹

For now, Italy is still leaving all school-specific performance data in the control of the school. Thus although analyses can be carried out using aggregate data to investigate the general quality of the education system, the results of these analyses cannot yet be tied to any particular school, and there are no policy consequences for schools.

Information for Empowering Parents: The English Achievement and Attainment Tables

In England, the transition from self-evaluation to use of data for institutional comparisons has already been completed. This section investigates the

information that is collected, produced, and made available to parents to help them choose the best schools for their children.

The introduction of the Achievement and Attainment Tables (AATs) in the United Kingdom came as a result of a process aimed at making parents more effective partners in their children's education. The first "Parent's Charter," published by the Conservative government in 1991, promised the publication of examination results in order to give parents the information they need to make informed choices for their children's schooling.¹⁰ The Education Reform Act of 1988 provided the basis for national testing and the collection of comparative test score data through the establishment of a uniform national curriculum, which sets standards of achievement in each subject for pupils aged 5–14.¹¹ Students are tested at the end of each "key stage" (i.e., ages 7, 11, 14, and 16), providing an indication of how pupils and schools are performing in comparison with national standards.

The resulting "school performance tables" for secondary schools in England, Scotland, and Wales were first published in 1992. The tables contained an alphabetical list of schools along with information about the number of students in the relevant age cohort and the percentage of those students meeting the relevant standard or its equivalent. Primary school tables were published in 1997 and were based on the performance of 11-year-olds on key stage 2 tests.

In 1999, unique pupil numbers (UPN) were introduced, allowing for more accurate matching of student records over time; earlier, records had been linked using pupils' names and dates of birth. Even though not all pupils have a UPN yet (due to errors in assigning them or other external factors), it is possible to match records in the absence of UPNs by using other techniques. The UPN system has allowed the Department for Children, Schools and Families¹² (DCSF) to construct a national pupil database, linking test data to the information provided by the Pupil Level Annual Schools Census¹³ and improving consistency in the value-added analyses.

The initial school performance tables were based on raw score figures, which caused continuous debate as students' raw scores are heavily dependent on prior attainment and family background and may not correctly reflect the contribution of the school to students' learning. Partially as a result of these discussions, policymakers in Wales decided to abolish performance tables for individual schools in 2001. In the same year, Northern Ireland also decided not to publish

league tables anymore; schools would provide school-level exam results directly to parents. In 2003, Scotland decided to replace league tables with a baseline report on the National Priorities for Education, which measures the progress of schools in all local authorities against five national priorities (achievement and attainment, framework for learning, values and citizenship, learning for life, and inclusion and equality). The goal is to provide a broader range of information for parents in an attempt to offer parents a more rounded picture of their child's and school's performance while removing the emphasis on exams.

England has tried to remedy the shortcomings of the league tables by adding a measure of the "value added" by the school, instead of just reporting raw scores. The issue of value-added has gained in prominence with the understanding that using raw student scores does not adequately take into account the fact that students can have very different levels of attainment on arrival at a school. Value-added measures reflect the attainment of pupils in comparison to pupils with similar prior attainment. Also, many factors affect the progress that pupils make in school, such as levels of deprivation, special educational needs, and socioeconomic background. For this reason, the DCSF has developed the contextual value-added (CVA) measure, which uses statistical procedures to account for factors like lack of spoken English at home and eligibility for free school meals when measuring the effectiveness of a school or the progress made by individual pupils. The improved tables with CVA scores thus provide an estimate of how much value a school has added to its students, compared with how much those same students would have been expected to learn at an average school. School performance tables containing value-added scores for secondary schools were published in England nationally for the first time in 2002, with value-added for primary schools following a year later.

The CVA model is based on the actual test and exam results of the given year group. It calculates the national average results attained by each category of pupils, the so-called "statistical prediction," and subsequently compares each individual's exam results against that prediction. Each pupil's CVA is the difference (positive or negative) from the statistical prediction. The calculation proceeds through four phases: a prediction of attainment based on the pupil's prior attainment, an adjustment of the prediction taking into account the pupil's set of characteristics, an adjustment for the school-level prior attainment, and an obtainment of a CVA score by measuring the difference between the pupil's

Table 2

Variables included in the contextual value-added model

VARIABLE	DESCRIPTION
Gender	Allows for the different rates of progress made by boys and girls by adjusting predictions for females.
Age	Looks at a pupil's age based on their date of birth.
Eligible for Free School Meals (FSM)	Pupils who are eligible for free school meals. The size of this adjustment depends on the pupil's ethnic group, because data show that the size of the FSM effect varies between ethnic groups.
Ethnicity	Adjustments for each of 19 ethnic groups.
Special Educational Needs (SEN)	The variable refers to pupils who are served by school SEN and Action Plus programs, programs for children who have learning difficulties or disabilities that make it harder for them to learn or access education than most children of the same age. Help will usually be provided in their ordinary, mainstream education setting or school, sometimes with the assistance of outside specialists.
First Language	Adjustment for the effect of pupils whose first language is other than English. The size of this adjustment depends on the pupil's prior attainment. This is because the effect of this factor tends to taper, with the greatest effect for pupils starting below expected levels and lesser effects for pupils already working at higher levels.
"In Care" Indicator	Those pupils who have been "In Care" of their local authority (e.g., living with foster parents) at any time while at their current school.
Mobility	Pupils who have moved between schools at non-standard transfer times.
Income Deprivation Affecting Children Index (IDACI) <i>Average and range of prior attainment within the school (KS2-3, KS2-4 and KS3-4 only)</i>	A measure of deprivation based on pupil postcode.

actual attainment and that predicted by the CVA model.¹⁴ The background variables used by CVA are shown in Table 2.¹⁵

Currently the Achievement and Attainment Tables are published annually by the Department for Children, School and Families. The tables include both raw scores and contextual value-added scores for primary and secondary schools in England.¹⁶ The figures are based on all local authority-maintained primary and middle schools with pupils eligible for assessment at the time of the tests in English, math and science.¹⁷ The schools attended by more than 90

percent of pupils in the country are included in the tables.¹⁸ Although individual student scores are necessary for producing the relevant statistics, so far results have been presented only with reference to the aggregate of the school cohort and the student group.

Once the basic data have been published by DCSF, many newspapers and journals in the U.K. proceed to create rankings of schools based on the criteria included in them. The BBC and *The Guardian* are some of the well-known publications which make such league tables available to the public, allowing comparisons based on exam scores and value-added (within a region or a city) as well as offering each school's complete information (both raw scores as well as CVA scores). An example of a school performance table—one created by the BBC based on the statistics released by the DCSF—can be found in Figure 2.¹⁹

A new initiative by Prime Minister Gordon Brown, announced in early January 2008, proposes further improvements such as giving parents the ability to use the internet for tracking the attendance, behavior, and academic performance of their children in secondary school by 2010, and in primary school by 2012. The new plan is based on the principle of transparency through real-time communication between parents and schools with information being available online, but also via email, text messaging, and potentially even teleconferencing.

South Korea and Data-driven Management

The English school performance tables provide a wealth of information to parents, school management, and local education authorities on the performance of schools. However, the possibility of building a truly data-driven system of educational management requires at least one more step. The South Korean case exemplifies what this additional step is, what it entails, and what the related risks are.

South Korea's shift towards data-driven management of its educational system is a consequence of a much wider move towards e-government, which has been in progress for more than 20 years already. The idea behind e-government is the transformation of the public sector's internal relationships and its service delivery from government-driven, process-based, and location-specific to one that is customer-driven, competency-based, and accessible from anywhere through the diffusion of digital technologies with the goal of improving effectiveness and efficiency. It is based on the creation and

Figure 2: Sample school performance table

Brislington Enterprise College

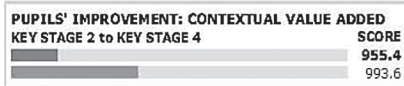
Hungerford Road, Brislington,
Bristol, BS4 5EY
Tel: 0117 3772055

TYPE: Community,
comprehensive, boys and girls,
business and enterprise

AGES: 11-18

KEY: ■ This institution ■ LA average ■ National average

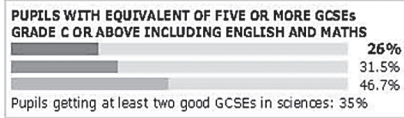
Bar chart shows performance relative to worst/best.
What do these figures mean?



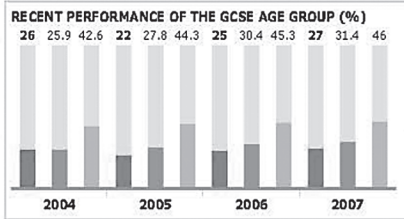
The Contextual Value-Added Score (CVA) evaluates the progress made by students at this school between age 11 and age 16 (key stage 2 to key stage 4) compared with the progress made by students at other schools. To calculate the score, the actual achievement of students at this school at age 16 is compared with what these students would have been predicted to achieve based on prior achievement (at age 11) and a range of other variables which are understood to affect performance (e.g., student background). How students at this school actually performed—either better or worse than predicted—is a measure of the value added by the school.

GCSE-LEVEL PERFORMANCE

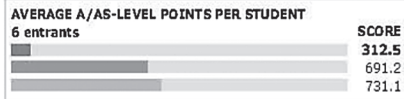
251 eligible, 9.2% of whom had special educational needs



The percentage of students who achieved the Level 2 objective (i.e., proficiency—measured by results in GCSE exams at grades A to C or their equivalents) in five or more subjects including English and Math.



Percentage of students who achieved the Level 2 objective (five or more GCSEs at grades A to C) for the previous three years.



KEY: ■ This institution ■ LA average ■ National average

Bar chart shows performance relative to worst/best.
What do these figures mean?

ABSENCE: 9.9% total (9.6% locally, 7.8% nationally)
2.9% unauthorised (2.6% locally, 1.4% nationally)

integration of information services infrastructures, and its success is contingent upon the high diffusion of internet use among South Koreans.

Since 1986, when the South Korean government started developing the basic telecommunication infrastructure and department information systems with the National Basic Information System program, the nation has been at the forefront of exploring and implementing the possibilities of e-government.

Table 3
Information collected by NEIS

	ADMINISTRATIVE AREA	TYPE OF INFORMATION AVAILABLE
GENERAL AFFAIRS	HR management for teachers	Registered/current number of teachers, hr records, hiring, salary step, years of service, transfer, promotion, etc.
	HR management for staff	Registered/current other staff, hr records, hiring, salary step, years of service, transfer, promotion, etc.
	Payroll	Monthly salary, annual salary, performance-based bonus, health insurance, etc.
	Planning	Major work, organization evaluation
	Emergency	Civil defense drills, training of military personnel for emergency responses, etc.
	Public private partnerships	Institutional info, budget/settlement, ledger, etc.
	Facilities	Facility building projects, school facilities, maintenance, accommodation plan, etc.
	Property	Management of shared properties, property ledger, reuse of properties of closed schools, etc.
	Supplies/Materials	Acquisition/operation management, survey of goods, statistics on needs and consumption of goods, etc.
	Budget	Budget planning, statistics, etc.
	Accounting	Revenue/expenditure, contract/seizure, settlement fund, etc.
	School accounting	Budget, revenue, expenditure settlement, financial management, etc.
	Lifelong education	Lifelong education facilities management, registration of private and educational institutes, etc.
	Qualification exam for school admission	Application acceptance, exam scores handling, exam site management, statistics, etc.
	Educational statistics	School status, student status, teacher status, facilities status, etc.
	Property registration	Property ledger, details management, property report, etc.
	Audit	Audit plan, audit status, cyber audit, etc.
	Legal affairs	Legal info, precedent info, interpretation of legal questions, etc.
	Public release	Press release management, etc.
	System management	Code management, integration, authority management, log management, etc.

The *UN E-Government Survey 2008* ranks it second in e-participation and sixth in e-government readiness in the world. (The United States is first in e-participation and fourth in e-government readiness).²⁰

The National Education Information System (NEIS²¹) was launched by Ministry of Education and Human Resource Development at the end of 2002 as one of eleven projects selected by the Cyber Korea 21 plan implemented by the Korean government.²² Based on the principles of efficiency and transparency, NEIS introduced an open source data management system

Table 3
Information collected by NEIS (cont'd)

	ADMINISTRATIVE AREA	TYPE OF INFORMATION AVAILABLE
ACADEMIC AFFAIRS	Academic affairs	Management of school information, designing yearly curriculums and courses, organizing classes and assigning students,
		Management of student information (11 categories): name, identification number, address, gender, family educational background, status of school attendance, awards, certificates, hobby, examination achievement and performance (including scores and rank) * Based on the transcript of the student's school record act
	Admission to a school of higher grade	Online transmission of grade and personal information to a school of higher grade
	Student health	Medical record of protective inoculation, physical growth status, school sanitation environment management, statistics, etc. * Based on "school health statue" and "school sanitations act"
	Supervision	Announcement of government educational curriculum, etc.
	School meals	Statistics of school meals, daily school meals management, etc.
	Physical education	School physical education facilities management, athlete management, statistics, etc.
G4C SERVICE	G4C service (Home education)	Online request and issuance of certificates, parents' services

allowing integrated handling of and access to administrative domains and functions by interconnecting the Ministry of Education and Human Resources Development, the 16 metropolitan and provincial offices of education and their affiliated institutions, and all elementary and secondary schools.²³ The implementation of this ambitious project has highlighted the inherent controversies of such systems, especially with respect to privacy, the protection of personal information, and the conflict between sharing and protecting information.

NEIS was designed as a web-based, integrated, and centralized online education administration system, standardizing and making available via internet information on 27 administrative areas within education—including personnel management, budgeting, accounting, student health, admissions, etc. Different end-users (ministries, provincial education offices, schools, parents, and students) were to have access to different types of information. Table 3 shows the types of information contained in each of the 27 administrative areas for which NEIS collects data.

When NEIS was launched, there were intense controversies over various issues (including costs and concerns over administrative burden), but the greatest debate was over the protection of human rights and the possibility of privacy infringements. Under the old system, information about students (e.g., health records and transcripts) was collected and managed by school head teachers on separate servers in each school. NEIS was supposed to interconnect these isolated systems and make the information they contained available over the internet to authorized users, so that educational affairs could be managed electronically. Under the new system's design, student data were stored in a database, not in local schools, but in metropolitan and provincial offices of education, with data transmitted over the network back to the local schools. This setup increased the risk of personal data being misused or made public.

Various organizations opposed the implementation of the NEIS due to this threat to student privacy, and the national teacher union organized a strike. In 2003, the National Human Rights Commission announced that NEIS infringed basic human rights and issued an official statement against its implementation. It recommended that the ministry of education stop storing three categories of information within the NEIS: part of the academic affairs category (school management information and student academic records), student health records, and enrollment records. The other 24 categories of administrative data would continue to be part of the NEIS system.

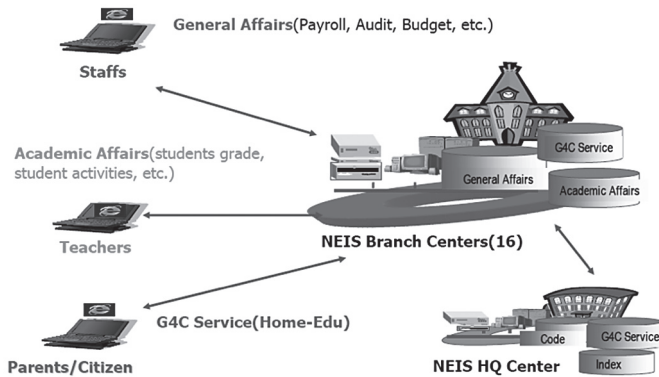
An advisory organization with representatives from the teacher and parent associations as well as the government, was launched to address the privacy concerns. As a result, the three controversial NEIS data categories (school management information, student academic records, and health and enrollment records) were separated from NEIS in March 2004.

The modified system is designed so that information on all parts of school management (budgeting, accounting, facilities, training, etc.) are available online and can be easily accessed by schools and government education authorities. To address the privacy concerns over student records, the sensitive parts of those records are now stored in group servers for elementary and middle schools (one server for each 15 schools) and in separate servers for high schools and schools for the handicapped—not in provincial offices of education, as initially planned. Moreover, access to student data for anyone outside the school requires the head teacher's permission. The security system was strengthened by the

encryption of sensitive information (name, identification, etc.), and related laws and institutions were revised in order to protect private information.

Figure 3 shows the NEIS setup. “General Affairs” information is supplied by administrative staff (in schools or provincial education offices) and “Academic Affairs” information is submitted by teachers. With the exception of the sensitive student information discussed earlier, data are stored in the 16 offices of education across the country on servers which are in direct communication with NEIS headquarters. All the data are encrypted by using specific algorithms that index the institutions with specific codes.

Figure 3: How NEIS works



The G4C Service (also known as Home-edu) permits citizens to easily request transcripts and certificates of registration or graduation from any school in the country online and have them delivered directly. They can also file petitions, present proposals or make inquiries. The system also permits student grades and personal and health information to be transmitted online to the student’s next school. Parents have full access to their children’s academic and school records through the Home-edu service.

In spite of concern that the implementation of NEIS would mean increased administrative burdens, the system has significantly reduced redundant administrative work and simplified complex tasks through the automation and standardization of processes and forms, leaving teachers more time for teaching. (See Table 4 for an overview of the benefits of the system.) The on-demand features motivate parents to become more active participants in their

Table 4

Benefits of NEIS for school administrators, teachers, parents and the general public

BENEFITS OF NEIS FOR SCHOOL ADMINISTRATORS

TYPE OF WORK	BEFORE	AFTER	BENEFIT
Processing of existing workload	Manual document preparation	System-based work processing	Reduction of time and workload
Information Sharing	Offline exchange of necessary information between organizations and departments	Information shared through system interface	Prevention of duplicated preparation of data and reduction of documents to be submitted
Decision Making and Policy Setting	Manual document preparation when needed	Immediate inquiry and use of accurate data through the system	Minimized errors and enhanced accuracy

BENEFITS OF NEIS FOR TEACHERS

TYPE OF WORK	BEFORE	AFTER	BENEFIT
Statistics	Frequent preparation and reporting of various statistics	Automatic statistical creation by the system	Dramatic reduction in related work
Student Records Management	Redundant entry of basic student information whenever students advance to a higher educational institution	One-time entry of basic student information at elementary school	No need to re-enter same information
Evaluation	Manual preparation of academic performance improvement data by grade, class and subject	Automatic generation of academic performance improvement data	Reduction of administrative work for teachers
Training Course Management	Manual management of number of class hours and class formation	Automatic management of number of class hours and class formation	Reduction of related work
System Operation	School-based management	Metropolitan-, province-based management	No need for school to manage server system
Human Resources Management	Document-based management	System-based records management	Accurate data, record sharing

children’s education, as parents now have real-time access to relevant school information. NEIS has also made accurate and diverse statistical data available to the government, which it can use to design much more informed education policies and to manage and evaluate results. It is important to note that the success of the system has been dependent on that fact that Korea has one of the highest percentages of the population using the internet (around 85 percent), and all schools are provided with internet access.

Table 4

Benefits of NEIS for school administrators, teachers, parents and the general public (cont'd)

BENEFITS OF NEIS FOR PARENTS AND THE GENERAL PUBLIC

TYPE OF WORK	BEFORE	AFTER	BENEFIT
Document Submission	When students are transferred to other schools or advance to upper level schools, student records (paper or diskette) were delivered by the student or parents	Documents sent to related schools through the system online	Elimination of unnecessary documents being produced or submitted and personal visits
Certificate Issuance Services	Physical visit or mail-in application is required to get documents issued	Documents can be requested online and directly issued	Save cost and time of personal visit
Student Information Disclosure	Student information was acquired or students' problems were resolved through parent's personal visits to schools or interviews with teachers	Student information can be acquired through the internet, and problems can be resolved through internet counseling	Enhanced quality of public services

Lessons to Be Learned from Italy, England and Korea

The establishment of a well-functioning education accountability system is a challenge which has been approached differently in countries with disparate education systems, evaluation cultures, policy needs, and administrative capabilities. This chapter has attempted to provide an overview of different strategies and stages of development of such accountability systems while describing the challenges—methodological, cultural, and human-rights related—of data collection and analysis. The case studies illustrate three different levels of data use: data for self-evaluation, data aimed at ranking, and data for management and policy making. They show the evolution of data collection in education and its use for accountability, starting from a system with no previous experience (in the case of Italy); going through sophisticated methodologies for creating fair data comparisons so that the data can stimulate improvement among schools (as in the British example); and finally arriving at the Korean case of striving for efficiency while resolving an important element of the “Holy Grail”—personal data protection.

The Italian case provides evidence of the steps necessary for the development of a culture of evaluation. Collection and usage of data cannot simply be imposed on people whose roots lie in a different field, or the

tool would be considered an extra weight to carry, rather than a powerful instrument to use. In Italy, the schools were initially able to choose to participate in the evaluation system in order to gain prestige or information.

By the time the system became compulsory, the evaluation process already involved almost all Italian schools, and the confidentiality of the data reassured schools about their concerns involving unwanted (and potentially unfair) comparison with institutions of different socioeconomic makeup or other conditions. Now the system is understood, and the data will soon be used not only for counseling purposes, but also for the evaluation of school principals. Because of the increasing acceptance of data use, more detailed data will be collected, and there is growing demand for training in the use of the data. Thus the Italian case suggests the need of planning ahead, because building a system that is understood and used by schools and stakeholders is a process that can take many years.



The U.K. system of generating educational performance statistics has a few essential characteristics. It tries to identify the many factors influencing student performance and then evaluates schools on the basis of how they manage the various factors and best educate the student. It has increasingly focused on the use of relative indicators, monitoring the individual student's development both in comparison to his own previous achievement and to that of his peer group. It has also put an emphasis on the comprehensiveness of the evaluation system (i.e., the inclusion of a very large number of schools, covering both the primary and secondary cycles of education). The system gives parents the opportunity to make educated decisions about the schooling of their children and at the same time gives schools a stimulus for improvement.

Over the years, many have criticized the use of league tables because they could provide a false picture of the effectiveness of schools that, for example, serve students of poorer backgrounds or use International General Certificate of Secondary Education (IGCSE) exams rather than the traditional GCSE test for evaluating students.²⁴ As noted earlier, Scotland, Wales, and Northern Ireland have decided to abolish performance tables because they are considered divisive and are thought to place an unnecessary burden on schools.²⁵ Still, although "naming and shaming" could be detrimental to the schools that are not fairly depicted by the indicators in use, rankings serve as an important source of information for prospective students. In parallel with an accreditation

system centered upon inspections, they have proven useful for benchmarking, goal-setting, and self-improvement purposes. Moreover, the increasing use that the press has made of Achievement and Attainment Tables to construct rankings of schools has helped stimulate debates on school performance and has kept public opinion—and hence policy making—focused on the issue of school quality.

Instead of dismantling the system, England has tried to refine the measures with the development of the contextual value-added measure, and the joint presentation of raw scores and value-added measures serves the purpose of showing both the absolute performance of the school and also whether schools are meeting or exceeding expectations, given the students they enroll. It is expected that the availability of both raw and value-added scores could be of great interest to American parents, even if they are not as free to exercise choice as English parents are.

Of course, value-added measures are not unique to England. The Tennessee Value-Added Assessment System, (TVAAS) developed by William Sanders and first implemented in 1992, is possibly the first accountability system that made institutional use of value-added measures.²⁶ While the English model limits itself to producing an overview of school development, in the Tennessee case “teachers and schools are held accountable for making sure that their students improve in scores from one test to the next, not for having their students meet some fixed standard minimum score.”²⁷ In England, the information about school performance is available online to anybody as an important feature of a quasi-market in education that is organized around the idea of serving customers. As noted, this soon will extend to making data on individual students available online. The U.S. has so far not made much use of value-added rankings for schools. The methodology developed by Sanders in Tennessee is now part of the Education Value-Added Assessment System (EVAAS), a data analysis and reporting service offered by SAS in Schools. In the school systems that have contracted with EVAAS for value-added analysis to be performed, the results of the analysis are only available to the districts themselves.

On the methodological side, while the U.K.’s value-added methodology is publicly available, the methodology developed by Sanders in Tennessee is now a proprietary part of a private business initiative and is held in secret. Up to now, it has not been subject to any independent review. It is known, though, that the EVAAS is based on the assumption that “each child serves as his or her

own control.” Because the child’s earlier test scores are included in the model, and because important socioeconomic and demographic characteristics are already factored into a student’s earlier test scores, Sanders believes there is no need to statistically control for the influence of those variables on achievement.²⁸ The U.K. model instead specifically includes socioeconomic characteristics as control variables in the analysis — as these variables are believed to affect how well students learn — which means that data collection must include many of these contextual characteristics.

Assessing which kind of value-added model best serves the needs of the system and the students is an issue that goes far beyond the scope of this essay. What can be noted is that, while the TVAAS/EVAAS model makes it possible to link student results to individual teachers, there are still debates over whether the methodology accurately identifies causal relationships (i.e., whether the teacher or the school are the cause of low or high levels of student achievement, or whether other factors — that have not been controlled for — are responsible).²⁹ Thus a more descriptive approach, such as the English system that makes available to the public both raw scores and contextual value-added measures, seems more prudent.

Given its earlier experiences with value-added measures, why hasn’t the U.S. developed its own league tables? One reason might be the fact that No Child Left Behind has shifted the focus to the “percentage of proficient students” path as opposed to the value-added one. Another reason is that a broader consensus on the ways to calculate and implement value-added measures for statewide or nationwide comparisons has not yet been achieved.



The controversy sparked by the Korean NEIS system illuminates a key issue surrounding the use of sensitive data. The centralized availability of information could bring about economies of scale that would reduce the cost of data collection and data infrastructure while facilitating the use of information for evidence-based policy. But the required data are highly sensitive and touch upon the most intimate characteristics of individuals and their families (income, health status, family relations, etc.). The tension between the two objectives — the availability of data for analysis and data privacy — could have led the system to stall. The Korean success shows

how, through extensive negotiations, stakeholders have been able to reach a compromise. A technological solution (hosting the data on different servers) has allowed Korea to obtain many of the advantages of data availability while still providing an adequate level of data privacy.

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Appendix I

The education systems of the countries under consideration in this paper have a similar structure in terms of years, phases, and duration of compulsory education. The following table gives an overview of these systems, including the United States as a point of reference.

Education System Structure

	PHASES	AGE RANGE
ITALY	Primary education	First cycle 6–8 years
		Second cycle 8–11 years
	Secondary education	Lower secondary education 11–14 years
		Upper secondary education 14–15 years
		16–18 years
	Higher/ Further education institutions	18 years
UNITED KINGDOM	Primary education	Key stage 1 5–7 years
		Key stage 2 7–11 years
	Secondary education	Key stage 3 11–14 years
		Key stage 4 14–16 years
	Secondary schools/ Further education Institutions	16–18 years
	Higher/ Further education Institutions	18 years
KOREA	Primary education	6–12 years
	Secondary education	Lower secondary education (middle school) 12–15 years
		Upper secondary education (high school) 15–18 years
	Higher/ Further education institutions	18 years
USA *	Primary education**	6–11 years
	Secondary education**	Middle School 11–14 years
		High School 15–18 years
Higher/ Further education institutions	18 years–	

Compulsory Education

* No national structure, curriculum or governing law; all laws and policies are set and enforced by 50 state governments and 14,000+ local school districts, so indications of age are typical and can vary from state to state.

** Compulsory education—age of entry can vary from 5 to 7 years, age of exit—from 16 to 18 years

Endnotes

- † INVALSI, National Institute for Accountability in Education. Frascati, Italy <http://www.invalsi.it>. European Commission JRC, Centre for Research on Lifelong Learning (CRELL). Ispra, Italy <http://crell.jrc.ec.europa.eu>. Email: daniele.vidoni@invalsi.it.
- ‡ European Commission JRC, Centre for Research on Lifelong Learning (CRELL). Ispra, Italy <http://crell.jrc.ec.europa.eu>. Email: kornelia.kozovska@jrc.it
- 1 See Ray, “School Value-Added Measures in England.”
 - 2 See Appendix 1 for a detailed table.
 - 3 Constitution of the Republic of Italy, Article 33 comma 5: “E’ prescritto un esame di Stato per l’ammissione ai vari ordini e gradi di scuole o per la conclusione di essi e per l’abilitazione all’esercizio professionale”; translated as “A national examination is required to access the successive types and levels of education, to graduate, and to obtain licensing for professional work.”
 - 4 As indicated, the autonomy of school staff and school principal is mostly operational, and does not generally concern spending. Thus, the focus of schools has mainly been on acquiring tools for improving school organization and educational processes. As there was no tradition in Italy of evaluating these issues, many have turned to standardized procedures for certifying the quality of management and service delivery. The main standards in this area are ISO9000 and Baldrige, which were initially targeted at certifying industrial products but have evolved towards the certification of other products and services.
 - 5 Servizio Nazionale di Valutazione dell’Istruzione (National Service for Education Evaluation).
 - 6 Istituto Nazionale per la Valutazione del Sistema dell’Istruzione. www.invalsi.it
 - 7 These benchmarks are the indicators used to chart the progress of European Union school systems towards reaching the Lisbon objectives for education and training, which—roughly speaking—are to be attained by 2014. The benchmarks are based on the situation in Europe in 2000 and request:
 - Reduction by 10 percent of early school leavers;
 - Increase by 15 percent of graduates in math, science and technology;
 - Ensuring that at least 85 percent of the student population graduates from secondary school;

- Reducing by 20 percent the levels of low achievers in reading at age 15;
 - Ensuring that at least 12.5 percent of the adult population participates in lifelong learning activities.
- 8 Italy is administratively divided in 20 regions. The 20 regions are aggregated into five macro regions: North-West, North-East, Centre, South, Islands.
 - 9 Currently, these tests do not have any consequences for students, and—for cost reasons—it is not clear whether these tests will be given in the future to the whole population of students or just to samples. If entire cohorts of students are tested, then the test results could count toward students' grades.
 - 10 In the U.K., parents must apply for a place in school for their children, either their local school or an alternative school. When possible, these preferences have to be met, but where there are more applications than empty seats, the admission authority (the school or the Local Education Authority) has to follow published oversubscription criteria in the final allocation of places. Parents are then able to appeal the final school assignment, giving them a final opportunity to get the school of their choice.
 - 11 See Hoyle and Robinson, "League Tables and School Effectiveness."
 - 12 The Department for Children, Schools and Families is responsible for coordinating work across government related to youth justice, family policy, child poverty and child health while also taking over responsibility for education policy up to the age of 19 in England.
 - 13 The Pupil Level Annual School Census is a census of each pupil in school, and contains contextual details and a unique pupil number, enabling LEAs and DCFS to match attainment data and use the information collected for research, reducing the need to request further data from schools. It covers all schools in England in the maintained sector.
 - 14 For detailed information on the calculation methodology, see the Technical Annex of the Performance Tables at http://www.dcsf.gov.uk/performance/tables/va1_03/docD.shtml
 - 15 The CVA model uses data from the Pupil Level Annual Schools Census (PLACS), introduced in 2002 with the aim of collecting contextual data on pupil background factors from schools' administrative records on all pupils annually and not only at the end of each key stage.
 - 16 The tables can be found at <http://www.dcsf.gov.uk/performance/tables/>. There are two measures of value-added for each school: one related to the progress

made by the pupils at the end of key stage (KS) 3 since taking their KS 2 tests, and another related to the progress made by pupils at school leaving age since taking the KS 3 tests. The KS 2 to KS 3 value-added score compares the pupil's performance with the median performance of other pupils with the same or similar results at KS 2. The individual scores are averaged to give a score for the school that is represented as a number based around 100, indicating the value the school has added, on average, for their pupils (a score higher than 100 indicates that the school's students have performed better than similar students nationally). The KS 3 to GCSE/GNVQ measure is calculated in the same way with the respective KS3 and GCSE/GNVQ results. The individual AAT includes a confidence interval which estimates the uncertainty of the value-added score as a measure of school effectiveness due to the fact that the score is based on a given set of pupils' results for a particular test paper on a particular day and as such depends on the number of pupils included in the calculation. The primary school league tables are based on the results from the tests given at the end of key stage 2.

- 17 Special schools (educational institutions with the resources and staff expertise to meet the needs of pupils with special educational needs), pupil referral units, hospital schools or independent schools are not included.
- 18 Schools not included in the AAT are primary schools with ten or fewer pupils, any school where fewer than half of the pupils have matched data with which to calculate CVA, and some independent schools.
- 19 The table for this school can be found at http://news.bbc.co.uk/1/shared/bsp/hi/education/07/school_tables/secondary_schools/html/801_4032.stm. Explanations for each indicator have been taken from the BBC guide: <http://news.bbc.co.uk/1/hi/education/7176947.stm>; and DCSF: <http://www.dcsf.gov.uk/performance/tables/Final-Decisions-on-Changes-to-the-Content-of-the-2007-Achievement-and-Attainment-Tables.pdf>.
- 20 See *UN E-government Survey 2008*.
- 21 For more information, see the NEIS' <http://www.neis.go.kr>.
- 22 For more information on Korea's e-government initiatives, see http://www.korea.go.kr/eng/_eng_demonstration/demonstration.jsp.
- 23 A similar approach to the integration of educational applications is represented by the Schools Interoperability Framework (SIF), an industry initiative enabling the efficient and secure interaction and sharing of data among schools, districts and states through a common certification program

for educational management software. It defines common data formats and high-level rules of interaction and architecture, which guarantee interoperability between education applications regardless of the hosting platform. Until recently, SIF has been used primarily in the U.S., but it is progressively being implemented elsewhere (e.g., Australia and the U.K.). In fact, the U.K. Department for Children, Schools and Families issued a statement in July 2008 recommending the adoption and use of the Schools Interoperability Framework.

- 24 See for example: <http://education.guardian.co.uk/secondaries/story/0,,1988200,00.html>
- 25 See: <http://news.bbc.co.uk/1/hi/scotland/3137808.stm>; <http://news.bbc.co.uk/1/hi/education/1448158.stm>; <http://news.bbc.co.uk/1/hi/education/1109516.stm>
- 26 <https://tvaas.sas.com/evaas/login.jsp>
- 27 See Sanders and Horn, "Research Findings" p. 250.
- 28 See Sanders, Saxton and Horn, "The Tennessee Value-Added System."
- 29 See Kupermintz, "Teacher Effects and Teacher Effectiveness." Kupermintz notes that the TVAAS methodology is almost entirely focused on the relationship between student performance and teaching effectiveness, with the goal of measuring the unique and independent contribution a particular teacher makes to his/her students' growth, regardless of students' contextual factors (socio-economic background, ethnicity, prior knowledge, etc.). In fact, Kupermintz points out that much of Sanders' data appears to contradict this claim (that student background need not be controlled for statistically) leading to a model based on a circular logic where teachers and not students are responsible for learning and for producing measurable progress in learning outcomes.